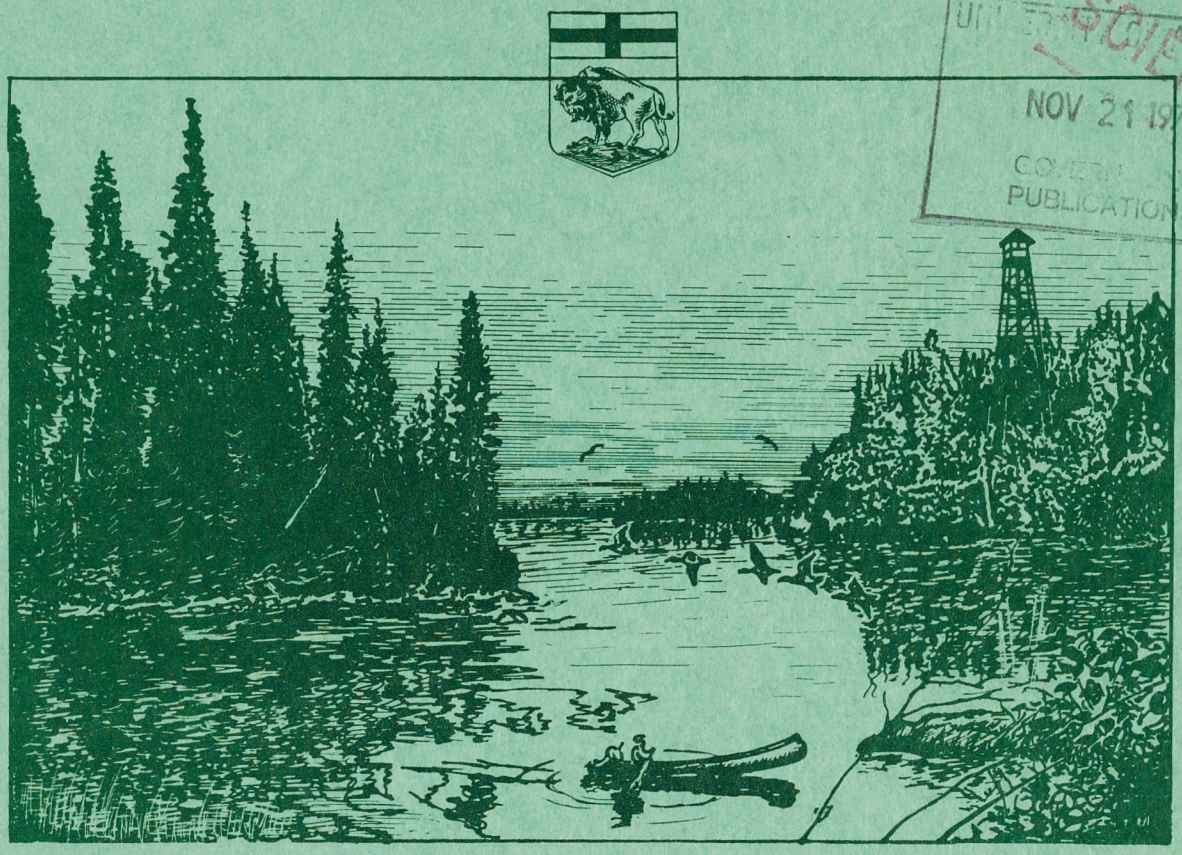
Report No. 7

NORTHERN MINING FOREST SECTION



Forest Resources Inventory

1956

FOREST SERVICE
Department of Mines and Natural Resources
PROVINCE OF MANITOBA

Winnipeg, 1959

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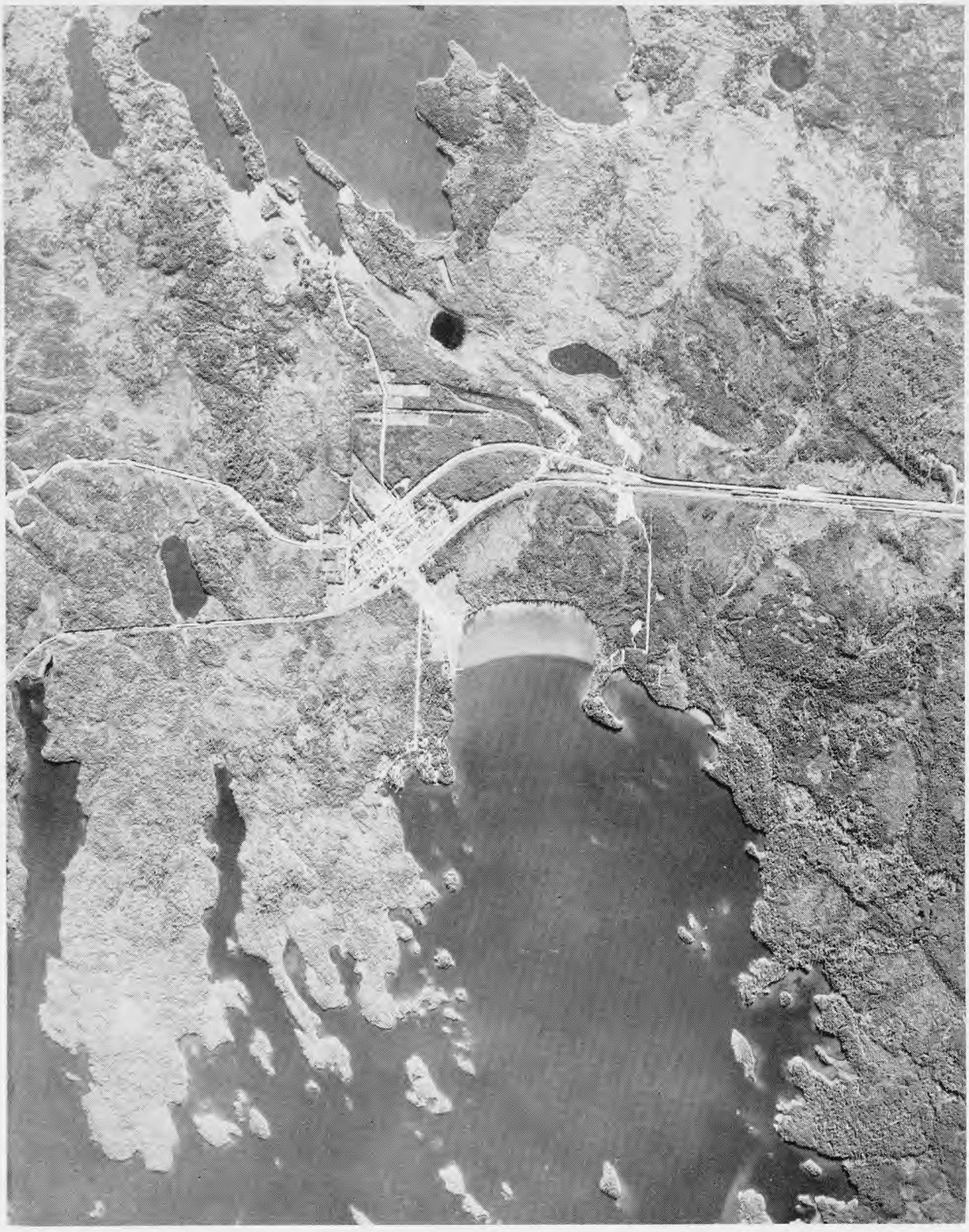

Forest Resources Inventory photograph of Village of Cranberry Portage, showing ancient portage trail between Athapapuskow and First Cranberry lakes, also modern highway and railway.

Preface

This is one of a series of bulletins summarizing the results of the ground and aerial survey work which was completed in 1956 in connection with the latest Forest Inventory of Manitoba. The figures in this new series will replace those previously used based on surveys made between 1927 and 1930, and tabulated in "The Forests of Manitoba, Bulletin 85," published by the Dominion Forest Service in 1934.

For the purpose of the new Forest Inventory the Province has been divided (as shown on Map 1) into four zones based on climate, original vegetation and predicted future use, as follows:

Agricultural	Transition from Forest to Tundra
Forest	Tundra or Barren Lands

The Forest Zone may be defined as the area which is producing or is capable of producing forest crops and which for climatic reasons is, in the main, more suitable for the production of wood than for agricultural crops. The Forest Zone has an over-all area (omitting the three major lakes—Winnipeg, Manitoba and Winnipegosis) of about 113,238 square miles or nearly half the total area of Manitoba (less these lakes).

Based on the presence or absence of transportation routes such as railways, highways and water routes, the Forest Zone is again divided into an Accessible and Inaccessible Area.

The Accessible Forest Zone with an over-all area of about 64,122 square miles has been divided for Inventory purposes into seven main Forest Sections based on physical geography and administrative boundaries, as follows:

Southeastern	Lowlands North
Winnipeg River	Nelson River
Lowlands South	Northern Mining
Mountain	

Each of the Forest Sections is again divided into Working Circles which conform with Forest Ranger Districts, except in the more northerly areas where on account of their large size it has been necessary to subdivide the Ranger Districts. In addition to the seven major Forest Sections listed above, the Accessible Forest includes two minor areas in southern Manitoba—the Spruce Woods and the Turtle Mountain Forest Reserves.

The Inaccessible Forest with an over-all area of about 49,116 square miles has been divided into 20 Inventory Units.

Although a limited amount of the Forest Zone was inventoried before 1951, the main work was done commencing April 1st, 1951, from which date the Federal Government has reimbursed to the Province one-half of the expenditures incurred in forest resources inventory under the terms of an agreement with the Province pursuant to the provisions of the Canada Forestry Act.

A separate report will be published for each of the seven major Forest Sections of the Accessible Area, and an eighth report will cover the Spruce Woods and Turtle Mountain. The whole of the Inaccessible Forest will be covered by an additional report.

An explanation of the method of survey is given in the Appendix.

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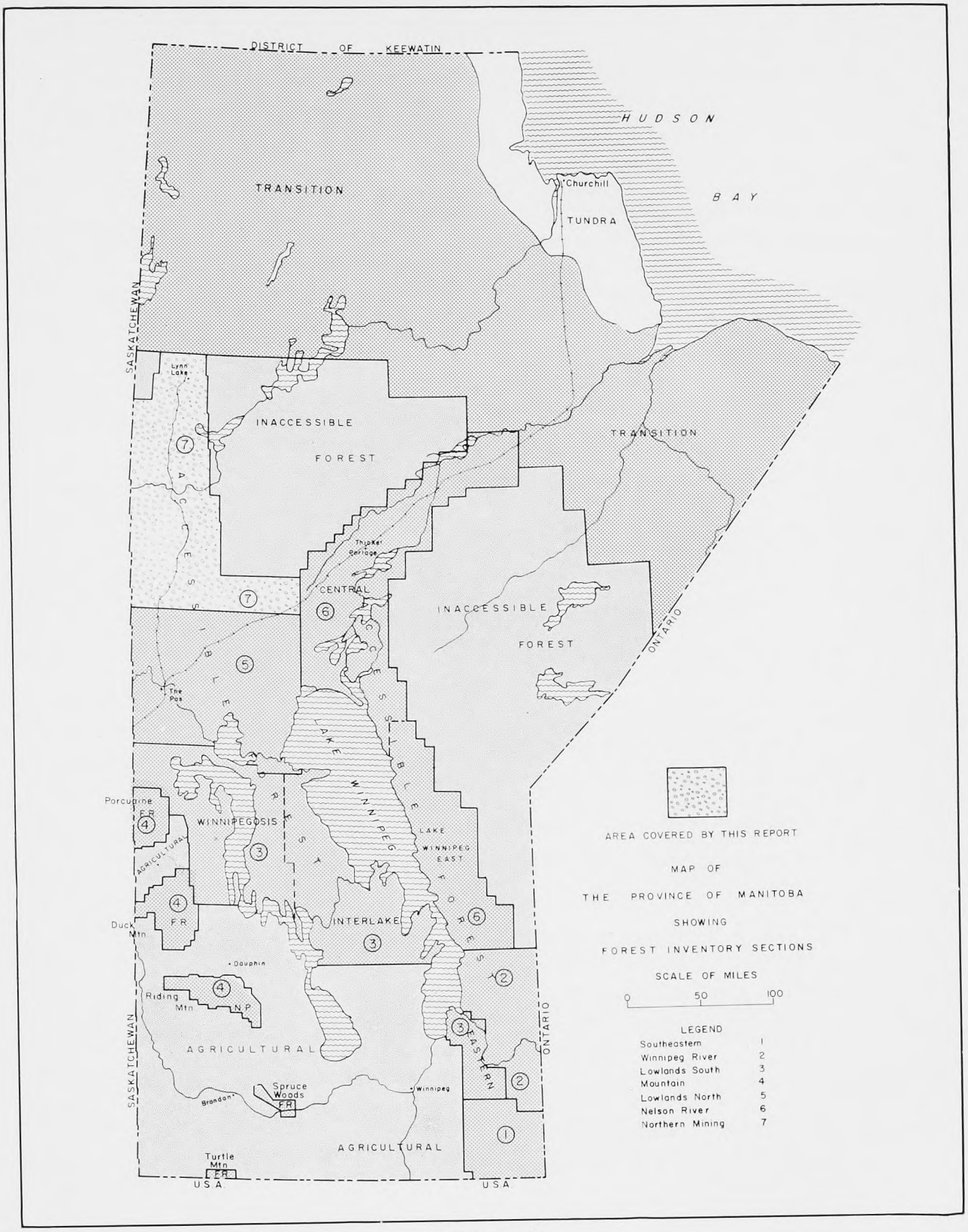

DISTRICT OF KEEWATIN
HUDSON BAY
TRANSITION
Churchill
TUNDRA
SASKATCHEWAN
Lynn Lake
INACCESSIBLE FOREST
TRANSITION
ACCESSIBLE
Thicket Portage
CENTRAL
INACCESSIBLE FOREST
ONTARIO
The Pas
ACCESSIBLE
LAKE WINNIPEG
Porcupine Mtn
WINNIPEGOSIS
AGRICULTURAL
LAKE WINNIPEG EAST
ACCESSIBLE
Duck Mtn
F.R.
INTERLAKE
Dauphin
Riding Mtn
N.P.
EASTERN
ONTARIO
AGRICULTURAL
Spruce Woods
F.R.
Brandon
Winnipeg
SASKATCHEWAN
AGRICULTURAL
Turtle Mtn
F.R.
U S A
U S A
AREA COVERED BY THIS REPORT
MAP OF
THE PROVINCE OF MANITOBA
SHOWING
FOREST INVENTORY SECTIONS
SCALE OF MILES
0 50 100
LEGEND
Southeastern 1
Winnipeg River 2
Lowlands South 3
Mountain 4
Lowlands North 5
Nelson River 6
Northern Mining 7

Map No. 1.

View of north arm of Lake Athapapuskow from forestry cabin at Baker's Narrows.

Forest Resources

NORTHERN MINING FOREST SECTION

Location and Area

The Northern Mining Forest Section consists of an area of Precambrian country which, as the name implies, has been extensively developed by mining industries. The forest section is bounded on the west by the Saskatchewan boundary, and on the south by the Lowlands North Forest Section. Contact is made with the Nelson River Forest Section on the southeast, while the remaining portions of the eastern and northern boundaries extend to the Inaccessible Forest and, at one point, to the Transition Zone—see Map No. 1. The forest section extends for 169 miles in a north and south direction and has a greatest east and west extent of 115 miles.

Table 1

Area Classification in Acres
Northern Mining Forest Section

CLASS OF AREA	Crown Land§ *total area*	*% of land area*
PRODUCTIVE FOREST LAND*	4,463,411	80.6
POTENTIALLY PRODUCTIVE FOREST LAND†	36,510	0.7
Clear cut	252	.....
Burn	13,918	0.3
Shrub	22,340	0.4
NONPRODUCTIVE FOREST LAND‡	853,186	15.4
Treed muskeg	756,244	13.7
Willow and Alder	1,788	.....
Treed Rock	95,154	1.7
NONFORESTED LAND#	186,105	3.3
Rock barren	558	.....
Marsh	17,205	0.3
Muskeg	162,055	2.9
Unclassified	6,287	0.1
TOTAL LAND	5,539,212	100.0
Water	1,096,766	19.8
TOTAL AREA	6,635,978	.....

*Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.

†Land not now supporting productive forest, but capable of doing so.

‡Land with a forest cover but incapable of producing a forest crop of merchantable size within a reasonable time.

#In general, lands not expected to produce forest of any kind.

§The amount of Patented Land is insignificant.

Wekusko (Herb) Lake, Flin Flon, Sherridon, and Lynn Lake are included within the area.

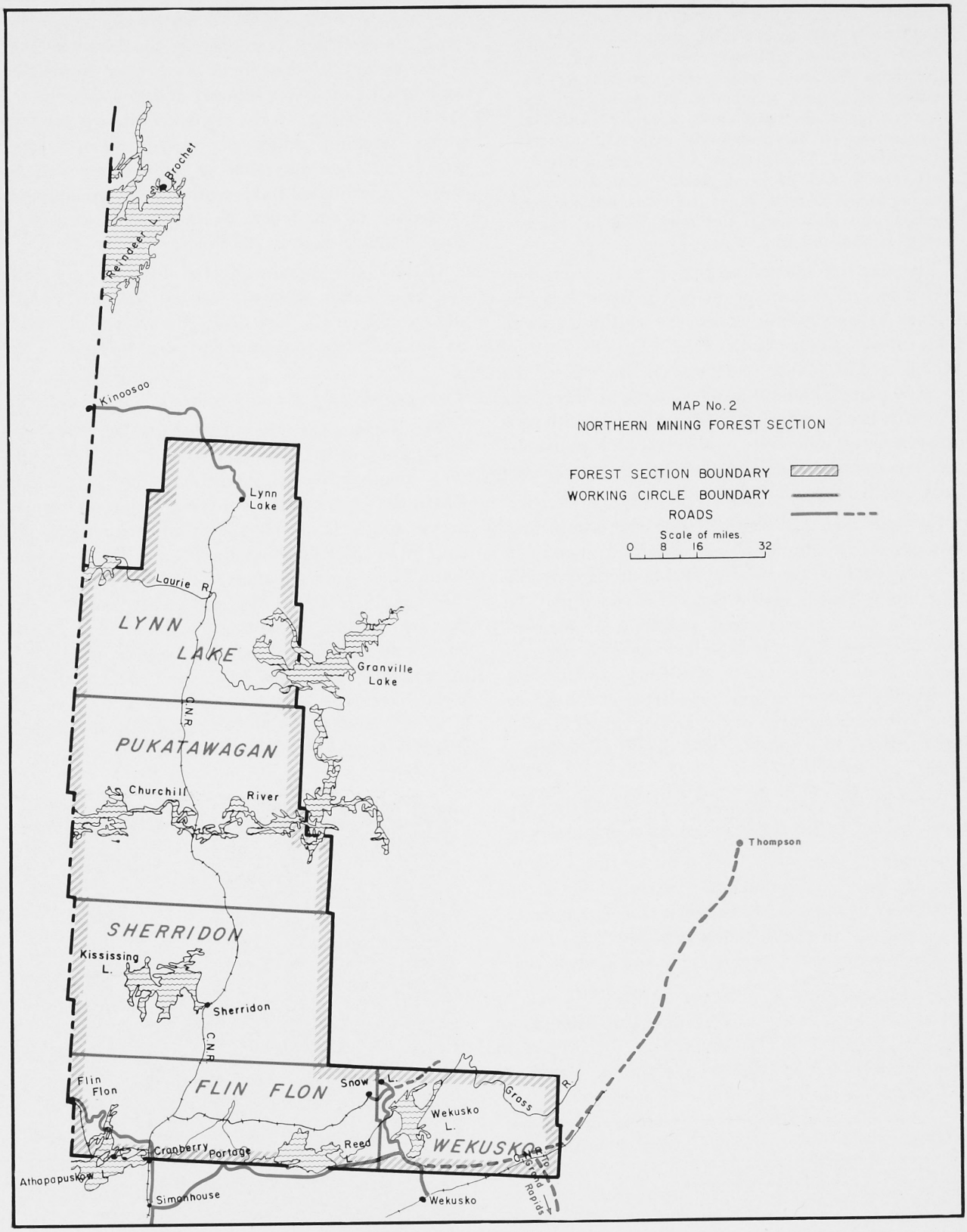
The over-all area covered by this report and estimate is 6,635,978 acres. This area excludes Indian Reserves, but includes all other land and water areas. The patented land area is so small that it has not been considered necessary to separate it from the Crown land. For inventory purposes, the area has been divided into five Working Circles—Wekusko, Flin Flon, Sherridon, Pukatawagan, and Lynn Lake.

Geology

The Northern Mining, along with the Winnipeg River, and the Nelson River forest sections, is part of the Canadian Shield. It shares with the Winnipeg River the distinction of not having been covered to any considerable extent by the water of glacial Lake Agassiz, and is in contrast with the Nelson River which was covered.

The early geological history of the region cannot be better described than was done by Dr. R. C. Wallace:—

> "The earliest stage was the outflow of basaltic lava — — — — — — on a surface which has been subsequently so much altered that it cannot with certainty be identified today. Subterranean activity then took place, the lower levels of the lava flows being cut by acid intrusives which show on the degraded surfaces today as quartz porphyry veins and sills. Then rivers and streams began to do their work, and lava flow and porphyry were worn down to pebble and sand and were deposited in out-wash fans and in shallow lakes as beds of sandstone (now altered to quartzite) and conglomerate. Elevation and erosion again took place, and again sediments were laid down. Later, subterranean activity took place on a stupendous scale, granites invaded the overlying sediments and lavas, which were intensely crumpled and folded during the process. Then followed a long period of planing down by the action of the atmosphere and running water, to the extent that the underlying granites were exposed over wide areas, and the earlier lavas and sediments were removed except where the folds were abnormally deep. There remains


MAP No. 2
NORTHERN MINING FOREST SECTION
FOREST SECTION BOUNDARY
WORKING CIRCLE BOUNDARY
ROADS
Scale of miles.
0 8 16 32
Reindeer L.
Brochet
Kinoosao
Lynn Lake
Laurie R.
LYNN LAKE
Granville Lake
C.N.R.
PUKATAWAGAN
Churchill River
SHERRIDON
Kississing L.
Sherridon
C.N.R.
Flin Flon
FLIN FLON
Snow L.
Gross R.
Wekusko L.
WEKUSKO
Cranberry Portage
Reed
Athapapuskow
Simonhouse
Wekusko
Grand Rapids
Thompson

Map No. 2

today in the exposures of the Precambrian—a comprehensive term to cover the period in which the above described processes were in being — in Northern Manitoba only a few portions of the earlier lavas and sediments, surrounded by extensive areas of granite and porphyry, which in themselves in all probability represent igneous formations of different ages. A very special interest attaches to such areas of greenstone and of sediment, for in them is found the veins and sheared zones in which occur the ores of gold, silver, copper, lead and zinc."([1])

The areas of altered sediments and lavas mentioned by Dr. Wallace occur in a more or less continuous belt, stretching across the southern part of this forest section from Flin Flon to east of Wekusko Lake and reaching northward in the western part to Kississing River, north of Sherridon. The area north and south of the Churchill River is mapped as granite but another area of sediments and lavas covers much of the region from Russell Lake north to Lynn Lake and beyond.

In more recent geological time the whole area was covered by the ice-sheets which advanced and retreated across the whole of Manitoba possibly four times. Traces of the last ice advance may be noted in the grooving and polishing of exposed rock surfaces. There is little evidence of terminal moraines marking stages of stationary ice-front but no doubt a ground moraine was left over the whole area, although on some of the higher ridges erosion has removed this material and deposited it lower down.

Possibly the most remarkable evidence left by the ice-sheet is the series of eskers which are conspicuous from Russell Lake northward to and beyond the northern boundary of the forest section. These eskers are thought to have been formed by streams of melt water running under or through the ice-sheet, leaving, on the retreat of the ice, narrow, steep, winding ridges of poorly assorted sand, gravel, and boulders. One of these eskers may be traced from Russell Lake northward to the northern boundary of the forest section and beyond to a total distance of over 100 miles.

Glacial Lake Agassiz affected this area very little, but as a matter of fact a narrow arm of this lake did extend up the Churchill River reaching as far as the Saskatchewan boundary and beyond.

Topography

The surface has the usual irregular, trendless, topography of the Canadian Shield, but it is somewhat rougher than the Northern Clay Belt which lies to the east, and the flat-lying limestone country to the south. Local elevations are, in general, not over 50 to 150 feet above the level of the numerous lakes. There are exceptions to this rule, for instance, the area north of Flin Flon has greater heights, also the area around Wekusko, Lasthope, and Laurie lakes, and, in some cases, elevations of 400 feet or more above lake level have been estimated. The highest recorded elevation is 1,400 feet above sea level at a point south of Dunphy Lake, although it should be noted that only a few lines of levels have

Table 2

Classification of Productive Forest Land by Cover Types—Northern Mining Forest Section

COVER TYPE	Crown Land§	
	acres	*%*
S: Over 75% softwood	3,416,293	76.5
M: 50 - 75% softwood	941,338	21.1
N 25 - 50% softwood	53,007	1.2
H: Under 25% softwood	52,773	1.2
TOTAL	4,463,411	100.0

§The amount of Patented Land is insignificant.

[1]Mining and Mineral Prospects in Northern Manitoba, 1920, R. C. Wallace.

Good stand of spruce pulpwood on Grass River.

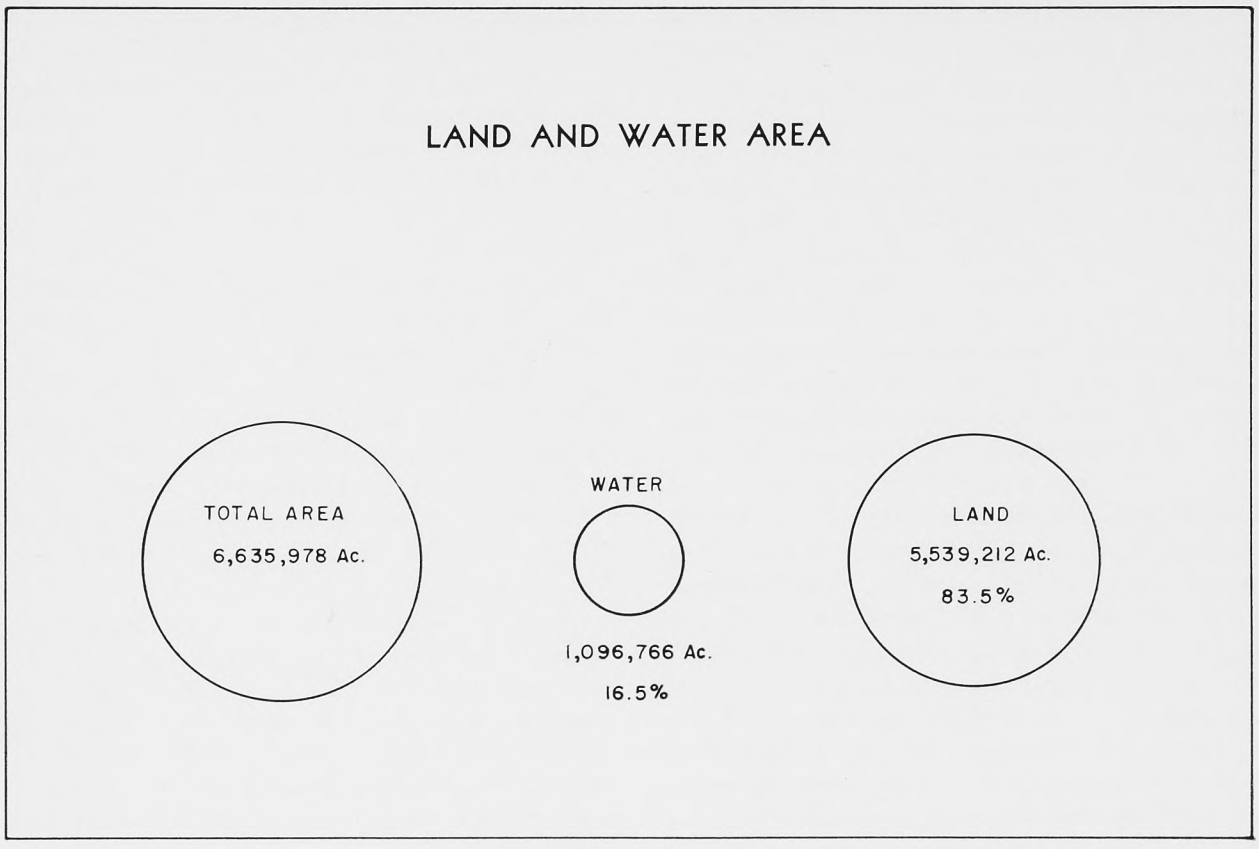


Figure 1.

been run in the area. The lowest point is probably at Pakwa Lake where the Grass River passes out of this forest section, the water level of this lake being 741 feet above sea level.

This region drains into three great river systems, the Churchill, Nelson, and Saskatchewan. The Churchill which crosses the northern arm of the forest section has the Laurie and Keewatin rivers as tributaries from the north, and the Kississing from the south. The Nelson River receives water mainly through the tributary Grass River which has the Cranberry Lakes, as well as Elbow, Reed, and Wekusko lakes on its course. A second main tributary of the Nelson is the Burntwood River, which drains File, Guthrie, and Burntwood lakes. The Saskatchewan receives water from Athapapuskow and Schist lakes as well as other lakes in the Flin Flon area.

Soils

The Precambrian rock which underlies the whole of the Northern Mining Section is, generally speaking, covered with sufficient soil to support satisfactory tree growth. "Rock" and "treed rock," types which together may be referred to as "dry waste," occupy less than two per cent of the land area, and these areas are largely confined to the Flin Flon, and Wekusko working circles in the southern part of the forest section. The "wet waste" types made up of the "muskeg," "treed muskeg," and "marsh" types occupy 17 per cent of the area, which is a lower proportion than that found in the adjoining Lowlands North, and Nelson River forest sections.

The parent soil material is predominantly till, especially in the southern areas as far north as the Churchill River. The arm of Lake Agassiz, referred to above under geology, deposited a good depth of lacustrine soils over hills and hollows along the Churchill. Although not specifically noted, there are no doubt, other local areas of lacustrine sediments derived from smaller glacial lakes. North of the Churchill River, broad sand ridges and plains are predominant, and further north sandy and gravelly eskers are conspicuous. The sand ridges

and plains are thought to have been formed as outwash from esker streams.

Soil surveys have not covered this region but indications are that all soils have an acid reaction. An exploratory examination made by The Manitoba Soil Survey along the Flin Flon Highway has revealed that some of the till soils are Podzols and others are Brown–Podzolic, depending on whether the parent soil material is derived from acid granites, rhyolites, and gneisses, or from more basic rocks such as gabbros, andesites, and schists. Grey-wooded soils may occur to a small extent along the southern margin of the forest section where limestone rock overlies the Precambrian.

Climate and Natural Vegetation

The Northern Mining Forest Section of the Manitoba Inventory covers a portion of the Northern Coniferous Section, B.22a, of the Boreal Forest Region, as mapped in "Forest Regions of Canada."* It extends northward along the Lynn Lake Railway and beyond as far as Goldsand Lake, and thus reaches a short distance into the Northwestern Transition Section, B.27 of the above mentioned forest classification. Although it is well known that there is a close relationship between climate and vegetation, it must be admitted that, in this particular region at least, insufficient research has been done on either climate or vegetation to serve as a basis for drawing more than very approximate boundaries between the forest and the transition zones. It is quite possible that the Lynn Lake area, now included in the Northwestern Transition section, will ultimately be shown to be part of the forest zone proper.

No year round weather records are being kept in the forest section at the present time although meteorological stations are located at Brochet, Man., northwest of Lynn Lake, and at Island Falls, Sask., on the Churchill river, a few miles west of the provincial boundary. However, during recent years the Forest Service has kept records during the summer, of precipitation, humidity, wind direction, and wind velocity at Flin Flon, Sherridon, and Lynn Lake.

Charts prepared by the Meteorological Division of the Department of Transport, based on stations to the east and west, indicate that precipitation and temperature are about equal to that found in the northern two-thirds of the Nelson River Forest Section. Since the climatic lines run somewhat north of west, it may be assumed that the Flin Flon climate is about the same as that of Norway House, and the Lynn Lake climate is similar to that of Split Lake. The charts indicate that the annual precipitation for the Northern Mining Forest Section is around 15 to 16 inches. June and July are

*"Forest Regions of Manitoba," Forestry Branch, Department of Northern Affairs and National Resources, Canada, 1959.

View from Sherridon ranger station, young white spruce in foreground.

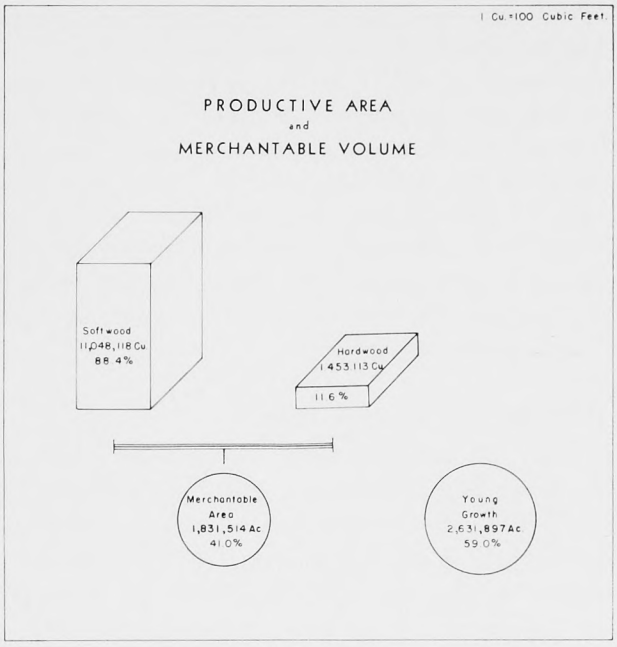


Figure 2.

the wettest months, followed by August, September, and May, in that order. The average mean daily maximum temperature for July is from 71°-75° above and the mean daily minimum for January is from 17°-30° below zero. The average length of the period free from heavy frost, taken as 29.5°, ranges from 120 to 105 days, and the frost free period, using 32.5°, is from 95 to 85 days.

The assumption that the climate of the Northern Mining is similar to that of the Nelson River is borne out by the tree species, and also by the shrub and herbaceous vegetation found in the two forest sections. Considerable quantities of spruce sawtimber have been cut in connection with mining development in the area, the most northerly operation of this kind being at Granville Lake, lumber from here having been used in construction at Lynn Lake. Several thousand cords of jack pine fuelwood were also cut around Lynn Lake and used for the initial development of power and for heating purposes.

The main tree species are black and white spruce, jack pine, aspen and balsam poplar, white birch, and tamarack. Balsam fir becomes scarce towards the north although it has been noted in the Lynn Lake Working Circle which is the most northerly; possibly its scarcity is due not so much to climate as to the frequency of forest fires in the past, fire being particularly harmful to this species by burning the humus layer which is more conducive to reproduction of balsam fir than it is to other tree species.

Early History

The Indians of the Northern Mining Section belong to the Cree tribe of the Algonkian stock who appear to have occupied at least the eastern part of the area since before the white man arrived. Probably the area north of the Churchill River was originally occupied by the Chipewyan tribe, a subdivision of the Athapascan stock. This later tribe are largely dependent on the barren land caribou which migrate in winter into the forest zone and go north again during the summer.

Table 3

Area Classification of Productive Forest by Age Classes, Cover Types and Merchantability—Northern Mining Forest Section

AGE CLASS *years*	COVER TYPES IN ACRES									
	S		M		N		H		Total	
	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.
0 - 20	1,093,102	.....	418,667	.....	.....	.....	1,438	.....	1,513,207	.....
21 - 40	616,441	20,321	247,657	8,885	.....	6,833	6,557	11,784	870,655	47,823
41 - 60	242,403	755,904	5,334	125,122	.....	27,851	.....	25,215	247,737	934,092
61 - 80	298	587,688	.....	115,511	.....	16,212	.....	7,099	298	726,510
81 - 100	.....	90,127	.....	10,162	.....	137	.....	680	.....	101,106
101 - over	.....	10,009	.....	10,000	.....	1,974	.....	.....	.....	21,983
SUBTOTAL	1,952,244	1,464,049	671,658	269,680	.....	53,007	7,995	44,778	2,631,897	1,831,514
TOTAL	3,416,293		941,338		53,007		52,773		4,463,411	

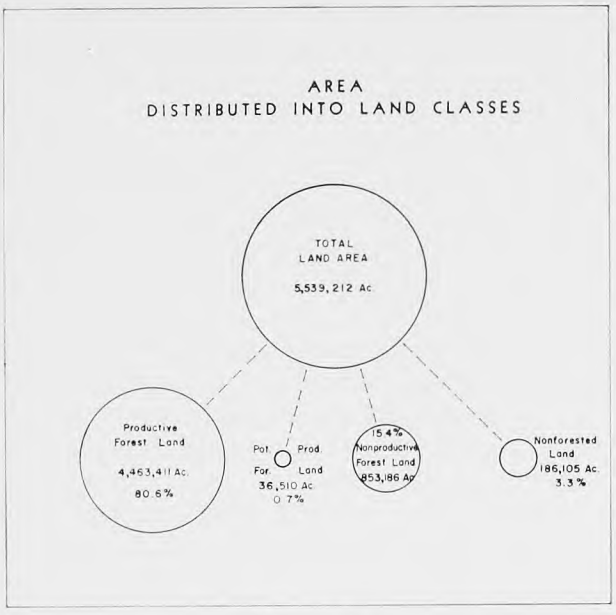


Figure 3.

The first white man to visit the region may have been Joseph Hanson who went inland for the Hudson's Bay Company in 1773-74 by way of South Indian Lake, Churchill River, Kississing River, and Lake Athapapuskow. Records show that before the year 1800 the Hudson's Bay Company had established posts at Wekusko Lake, Reed Lake, and at Sisipuk (Duck) Lake on the Churchill River. The Northwest Company, by the same date, had posts at Pukatawagan and Reed Lake, and competition between the two companies was keen. Since the union of the two companies in 1821, the region may be said to have had no history until quite recent times. The main routes of the fur trade continued to flow around this region, passing by way of the Saskatchewan River to the south and the Sturgeon-Weir to the west.

Development of the Area

After Canada took over Rupertsland from the Hudson's Bay Company in 1870, and up until the year 1912 when Manitoba's boundaries were extended to their present position, the area with which we are dealing was administered by the Dominion of Canada as a part of the territorial districts of Keewatin, Saskatchewan, and Athabaska. There were, from time to time, several changes in these boundaries, which had little significance in so far as this part of the area was concerned, since there was no population, except for the original Indians, a few white fur-traders and missionaries, and the odd prospector.

Aerial view of Flin Flon townsite.

Table 4

Softwood and Hardwood Volume by Age Classes and Cover Types—Northern Mining Forest Section

AGE CLASS *years*	*VOLUME IN CUNITS BY COVER TYPES (1 Cunit equals 100 cu. ft. of Wood) S			M			N			H			Total		
	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total
0 - 20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
21 - 40	118,056	7,086	125,142	27,480	10,234	37,714	13,098	14,885	27,983	9,016	32,527	41,543	167,650	64,732	232,382
41 - 60	3,417,768	212,147	3,629,915	504,865	180,025	684,890	76,086	80,723	156,809	29,310	130,123	159,433	4,028,029	603,018	4,631,047
61 - 80	4,875,937	304,064	5,180,001	710,540	232,183	942,723	64,162	71,669	135,831	8,585	48,577	57,162	5,659,224	656,493	6,315,717
81 - 100	947,721	58,477	1,006,198	74,227	25,579	99,806	500	522	1,022	518	5,469	5,987	1,022,966	90,047	1,113,013
101 - over	79,705	5,334	85,039	81,411	24,098	105,509	9,133	9,391	18,524	....	....	....	170,249	38,823	209,072
TOTAL	9,439,187	587,108	10,026,295	1,398,523	472,119	1,870,642	162,979	177,190	340,169	47,429	216,696	264,125	11,048,118	1,453,113	12,501,231

*Net roundwood volume: stump height 1′, top diameter 3″; one stacked cord equals approximately 85 cu. ft. of wood.

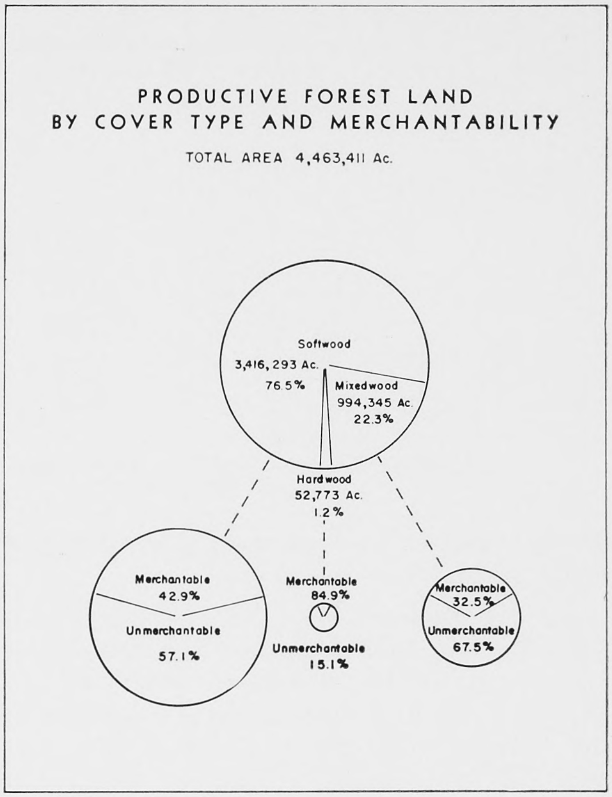


Figure 4.

As the name of this forest section implies, the modern development of the area is almost entirely bound up with the mining industry. The completion of the Canadian Northern Railway to The Pas in 1910 stimulated prospecting in the Precambrian region to the north by furnishing a base for outfitting. Previous to that time, prospecting parties left rail-head at Prince Albert, coming down the Saskatchewan River to Cumberland House, and thence by canoe up the Goose River, from which the Flin Flon area could be reached, or by the short Cranberry Portage into the Grass River system leading to Elbow and Wekusko Lakes.

Following the proving-up of a large copper-zinc orebody at Flin Flon, a railway was built to that point from The Pas in 1928. A smelter was constructed and hydro-electric power was brought from a new power plant on the Churchill River at Island Falls, Sask. Since that time, the Hudson Bay Mining and Smelting Company at Flin Flon has developed into the largest mining industry in the province, and a population of 13,000 people has grown up around the industry. In addition to cop-

Table 5

Softwood and Hardwood Volume by Cover Types and Size Classes—Northern Mining Forest Section

COVER TYPE	VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood			Hardwood			Total		
	4″ - 9″ D.B.H.*	10″ + D.B.H.*	Total	4″ - 9″ D.B.H.*	10″ + D.B.H.*	Total	4″ - 9″ D.B.H. *	10″ + D.B H.*	Total
S	8,752,639	686,548	9,439,187	521,842	65,266	587,108	9,274,481	751,814	10,026,295
M	1,141,962	256,561	1,398,523	407,749	64,370	472,119	1,549,711	320,931	1,870,642
N	127,171	35,808	162,979	151,020	26,170	177,190	278,191	61,978	340,169
H	38,388	9,041	47,429	187,271	29,425	216,696	225,659	38,466	264,125
TOTAL	10,060,160	987,958	11,048,118	1,267,882	185,231	1,453,113	11,328,042	1,173,189	12,501,231

*D.B.H. is an abbreviation for diameter at breast-height; trees are measured, outside the bark, at 4½ ft. above the ground.

per and zinc, this mine produces gold, silver, cadmium, selenium, and tellurium.

An important discovery of copper-zinc near Kississing Lake led to the building of a railway north from Cranberry Portage to the new town of Sherridon. The mine at this point was operated by the Sherritt-Gordon Mining Company, Ltd., from 1931 until 1951, except for a six-year break in the 1930's. Before the mine finally closed down on exhaustion of the profitable orebody, the company was fortunate enough to discover and prove-up a large nickel-copper deposit about 100 miles north at Lynn Lake. Most of the houses at Sherridon were hauled bodily by tractor train during the winter season, and the mine plant was dismantled and shipped in the same manner. A railway was completed to Lynn Lake in 1953, and a new community and mine was rapidly developed. In addition to nickel and copper this mine produces gold, silver, and cobalt.

Another important mining area in this forest section is in the vicinity of Wekusko (Herb) Lake.

Lynn Lake townsite in early stage of development.

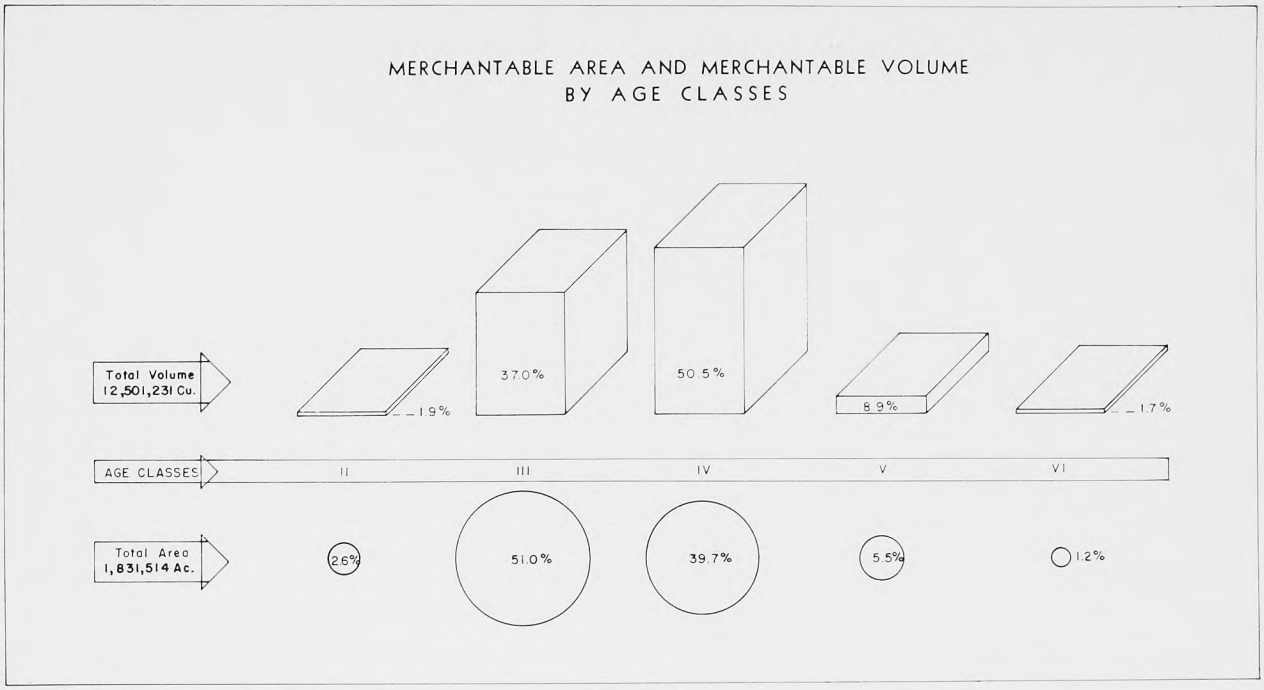


Figure 5.

This district was one of the earliest prospected, but no important development took place until a gold mine was opened up at Snow Lake by Brittania Mining and Smelting Co. Ltd. This mine operated from 1949 to 1958, handling approximately 2,000 tons of ore per day, producing gold and minor quantities of silver. Very fortunately, as it happened, before the mine was worked out, Hudson Bay Mining and Smelting Co. had made important discoveries of zinc and copper in the same general area, which are now under development. The new mining industry is taking over the townsite of Snow Lake and the town is being enlarged by the construction of new residences and general facilities. A railway from Optic Lake on the Sherridon subdivision is nearing completion and over this railway copper and zinc ore will be shipped to Flin Flon for further treatment commencing, it is anticipated, in 1960.

Local forest industries have naturally been stimulated by the mining and railway development, mentioned above. Further information on these forest industries is given under the section of this report headed "Forest Utilization and Potential Yield."

Ample hydro-electric power can be made available when required by any new industry in this region. There are several alternative sources, one of which would bring power from the Kelsey plant (now under construction) on the Nelson River. An alternative source would be Granville Falls on the Churchill River, a short distance east of the forest section boundary. There are several other potential power sites at not too great a distance, on the Churchill River, as well as minor sites on such rivers as the Grass and Burntwood. The Sherritt-Gordon mine at Lynn Lake is at present being supplied by two plants on the Laurie River, and a third site is available on the same river.

Trapping of fur-bearing animals is still of importance, and is managed under the registered trapline system. Beaver is the most valuable fur crop in this area, with mink, muskrat, weasel, otter, squiirrel, lynx, following in that order. Other species include wolverine, fox, marten, and wolves. Moose is the principal big game with woodland caribou and deer found in lesser quantities. Ducks, ptarmigan, and Canada grouse are the principal game birds utilized by the natives.

Commercial fisheries are operated in about twenty of the lakes of this forest section, the catch being mainly whitefish and lake trout, and there are fish processing plants at Flin Flon, Lynn Lake, and Granville Lake, which receive fish not only from

Table 6

Softwood and Hardwood Volume by Species and Size Classes—Northern Mining Forest Section

SPECIES	*CUNITS BY DIAMETER CLASSES						†SAW TIMBER 10″ and Over
	Total		4″ - 9″ D.B.H.		10″ and Over D.B.H.		
	volume	*per cent*	*volume*	*per cent*	*volume*	*per cent*	*M. ft. b.m.*
White spruce	749,462	6.0	436,991	3.9	312,471	26.6	140,612
Black spruce	6,100,084	48.8	5,820,706	51.4	279,378	23.8	125,720
Balsam fir	150,762	1.2	138,310	1.2	12,452	1.1	5,603
Jack pine	4,022,505	32.2	3,638,874	32.1	383,631	32.7	172,634
Tamarack	25,305	0.2	25,279	0.2	26	.....	12
TOTAL SOFTWOOD	11,048,118	88.4	10,060,160	88.8	987,958	84.2	444,581
Aspen	919,725	7.4	840,638	7.4	79,087	6.8	35,589
Balsam poplar	394,170	3.1	295,359	2.6	98,811	8.4	44,465
White birch	139,218	1.1	131,885	1.2	7,333	0.6	3,300
TOTAL HARDWOOD	1,453,113	11.6	1,267,882	11.2	185,231	15.8	83,354
TOTAL ALL SPECIES	12,501,231	100.0	11,328,042	100.0	1,173,189	100.0	527,935

*One cunit equals 100 cubic feet of wood; one cord equals 85 cubic feet of wood.

†Saw-timber figures were obtained by converting the cubic foot volume of the size class 10″ D.B.H. and over to board feet on the assumption that one cubic foot is equal to 4.5 board feet.

this area, but also from lakes in the Inaccessible Forest and Transition Zones. Sports fish include pickerel, perch, lake trout and northern pike, and anglers are being attracted in increasing numbers as highways and railways are extended.

There has been a great development in the recreational use of this northern Precambrian area in recent years. There are over 400 summer cottages, about 10 licensed tourist camps, and 10 recreational sites. The summer cottages are mainly owned by residents of the local mining centres. The "recreational sites" are located, either on the main highways or on branch roads, at points where main waterways can be reached, and have parking, picnic, and camping facilities, as well as docks. Highway construction in recent years has resulted in a rapid increase in the tourist trade. Highway No. 10 was extended from The Pas to Cranberry Portage in 1948 and to Flin Flon in 1950. A road into Snow Lake and Wekusko from No. 10 will soon be completed, and an extension to Osborne Lake is planned. Residents of Lynn Lake have a road which connects with summer resorts at Berge and Zed Lakes and extends onward to Reindeer Lake.

Rapids on Churchill River.

The population of the forest section is estimated to be about 18,000 including about 600 Indians located on reserves along the Churchill River. The white population is mainly confined to the mining communities of Flin Flon, Lynn Lake, and Snow Lake.

Forest Administration

Until comparatively recently, the Northern Mining Forest Section was classed as an inaccess-

Table 7

Cubic Foot Volume per Acre Softwood and Hardwood by Age Classes and Cover Types—Northern Mining Forest Section

AGE CLASS *years*	VOLUME IN CUBIC FEET PER ACRE BY COVER TYPES														
	S			M			N			H			Total		
	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total
0 - 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21 - 40	581	35	616	309	115	424	192	218	410	77	276	353	351	135	486
41 - 60	452	28	480	403	144	547	273	290	563	116	516	632	431	65	496
61 - 80	829	52	881	615	201	816	396	442	838	121	684	805	779	90	869
81 - 100	1,051	65	1,116	730	252	982	365	381	746	76	804	880	1,012	89	1,101
101 - over	796	53	849	814	241	1,055	462	476	938	.....	.....	.....	774	177	951
MERCHANTABLE	645	40	685	519	175	694	308	334	642	106	484	590	603	79	682
PRODUCTIVE FOREST	276	17	293	149	50	199	308	334	642	90	410	500	248	32	280

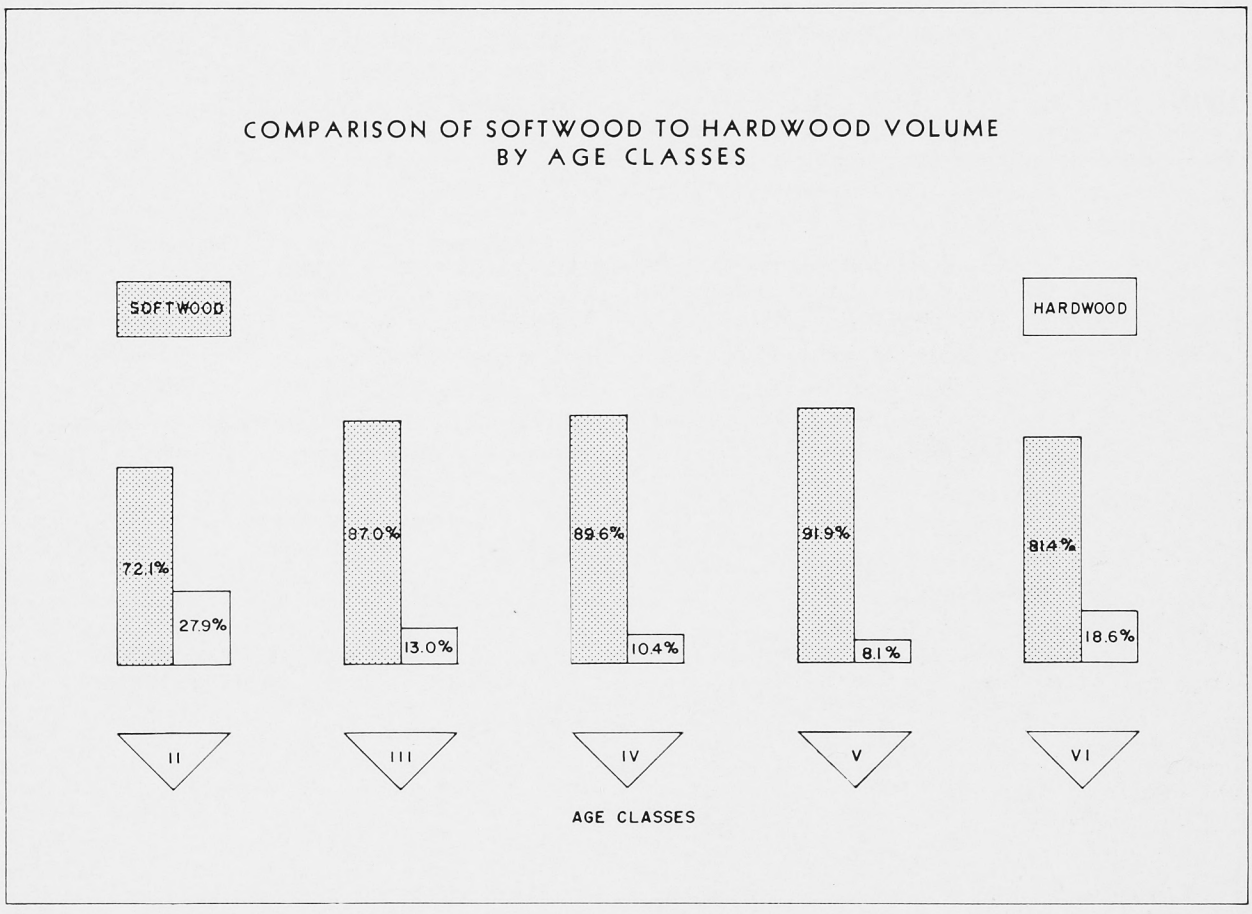


Figure 6.

Log boom—Lake Athapapuskow.

ible area, as far as forestry activities were concerned. Canoe patrols were carried out along some of the more southerly water routes after a Chief Fire Ranger's headquarters had been established at The Pas about 1912, and aircraft were used in detection of fire, and for transportation of fire-fighting crews and equipment after a seaplane base had been organized at Cormorant Lake in 1925. Commercial timber activities commenced along the Flin Flon railway during and after the construction of that line, and other areas further north attracted timber operators as the railway lines were advanced.

The administration of this forest section, along with others in Northern Manitoba, is supervised by the office of the District Forester, Northern Forest District, located at The Pas. For administrative purposes, the forest section includes Flin Flon, Sherridon, and parts of Snow Lake and Cranberry Portage forest ranger districts, and permanent rangers' headquarters have been established at these points. For inventory purposes, it has been more convenient to divide the area into five working circles—Flin Flon, Sherridon, Pukatawagan, Lynn Lake, and Wekusko.

Aircraft of the Manitoba Government Air Service, equipped with pontoons for water landing in summer, and with skis for landing on frozen lakes and rivers in winter, operate from The Pas and are used extensively in fire protection and, to a lesser

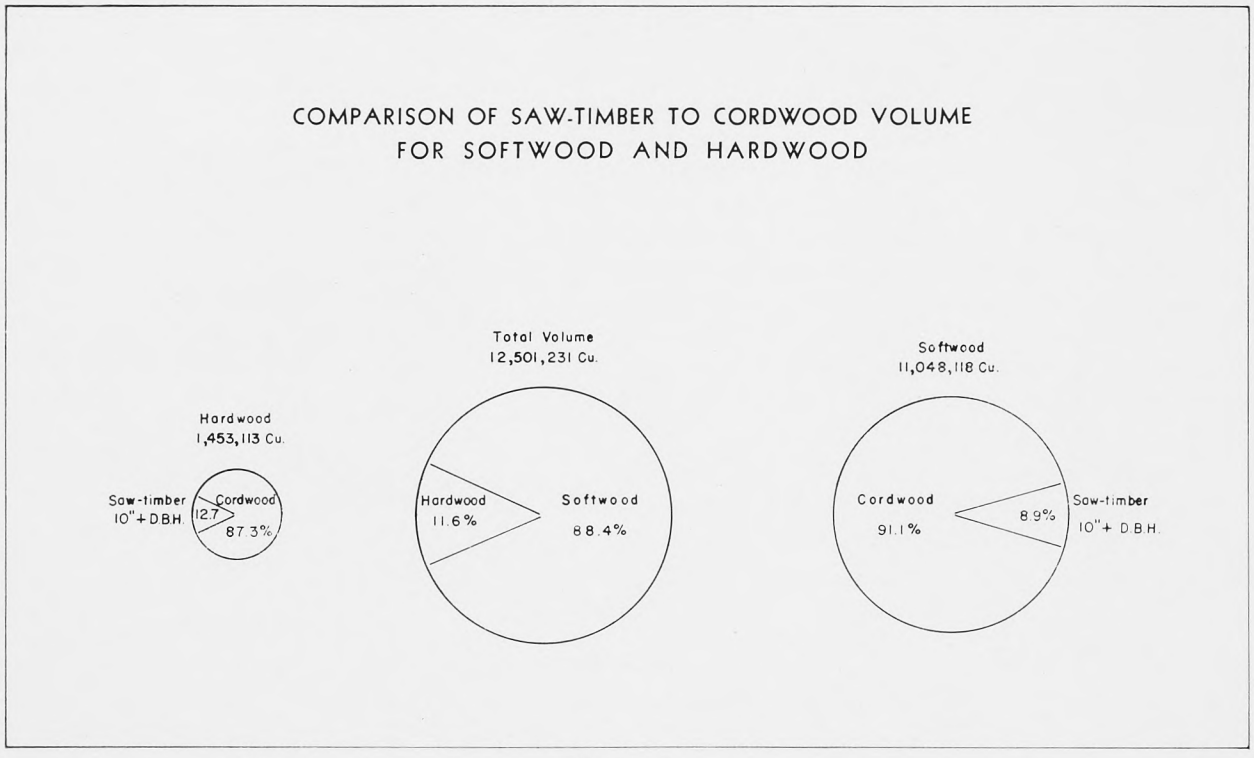


Figure 7.

extent, in timber administration. There are six steel lookout towers serving the area, and others are planned.

Fire control plans have been formulated covering this forest section as well as other parts of Northern Manitoba. Most of the forest section is given priority No. 1 in fire protection, although lower priorities have been allotted to areas at some distance east of the Lynn Lake railway. A figure has been set for annual acceptable burn for each of the five working circles.

Area Classification and Forest Composition

Table No. 1 shows that 80.6 per cent of the total land area of the Northern Mining Forest Section consists of productive forest land and 0.7 per cent as potentially productive, or a total of 81.3 per cent capable of producing timber crops. The proportion of actually productive forest land is higher than in any other forest section of the accessible forest area of Manitoba, the only forest section which approaches it being the Mountain Forest Section which has 78.4 per cent of productive forest land as compared with 80.6 in the Northern Mining Forest Section. The favourable situation re the high proportion of productive land in the Northern Mining Forest Section is accentuated by the fact that a large percentage of the waste land is concentrated in one working circle at the east end, i.e. Wekusko, see Table No. 8.

It may seem surprising that an area labelled Precambrian or Northern Mining, and which has been heavily glaciated, should have such a high percentage of productive forest land. The facts are, however, that the area has a satisfactory overburden of soil (from the forestry point of view), and also, there is a fairly good drainage system.

Table No. 2 shows the very high proportion of the productive area which has softwood types. The combined "S" and "M" cover types (50-100 per cent softwood) make up 97.6 per cent of the productive forest area, leaving only 2.4 per cent for the combined "N" and "H" cover types (0-50 per cent softwood)—see definition of cover types in the Appendix.

Considering volume by species, black spruce leads with 48.8 per cent, followed by jack pine, and aspen in that order, see table No. 6.

Tables 1 to 7 give area and volume data for the whole forest section, and tables 8 to 12 give similar information by working circles.

Forest Inventory

The Northern Mining Forest Section as Maps Nos. 1 and 2 will show is an "L" shaped area. The southern part, or the southern wing as it may be designated, extends from the vicinity of the Hudson Bay Railway, westward, to the Saskatchewan boundary, while the northern wing extends northward along the Lynn Lake Railway. Sufficient ground control for tying in the photographs for the southern wing was available in advance of the survey, from the 17th and 18th base lines, which, like other base lines in the Dominion land survey system, are 24 miles apart. For the northern wing, the pre-inventory control was rather scanty, consisting of a portion of the 23rd base line which had been projected from the east to the vicinity of the Lynn Lake Railway, and a number of lake and river traverses, the most important of which was one

Table 8

Area Classification by Working Circles—Northern Mining Forest Section

WORKING CIRCLES	LAND CLASSES IN ACRES					
	Productive Forest		Potentially Productive	Non-Productive Forest	Permanently Nonforested Land	Total Land
	Unmerchantable	Merchantable				
Wekusko	74,025	91,828	7,153	357,206	60,848	591,060
Flin Flon	180,534	526,626	2,857	141,112	41,687	892,816
Sherridon	395,883	617,524	16,275	104,531	34,333	1,168,546
Pukatawagan	895,506	458,763	7,327	119,437	27,542	1,508,575
Lynn Lake	1,085,949	136,773	2,898	130,900	21,695	1,378,215
TOTAL	2,631,897	1,831,514	36,510	853,186	186,105	5,539,212

Table 9

Area Classification of Productive Forest by Working Circles, Cover Types, and Merchantability—Northern Mining Forest Section

WORKING CIRCLES	AREA IN ACRES									
	S		M		N		H		Total	
	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.
Wekusko	18,287	54,437	55,042	23,602	.....	5,959	696	7,830	74,025	91,828
Flin Flon	140,575	372,974	38,526	111,510	.....	26,796	1,433	15,346	180,534	526,626
Sherridon	325,358	507,818	69,950	73,472	.....	16,127	575	20,107	395,883	617,524
Pukatawagan	654,392	404,208	239,136	49,804	.....	3,268	1,978	1,483	895,506	458,763
Lynn Lake	813,632	124,612	269,004	11,292	.....	857	3,313	12	1,085,949	136,773
SUBTOTAL	1,952,244	1,464,049	671,658	269,680	.....	53,007	7,995	44,778	2,631,897	1,831,514
TOTAL	3,416,293		941,338		53,007		52,773		4,463,411	

along the Churchill River. In order to fill the gaps in ground control, the provincial Surveys Branch during the winter of 1951-52 extended the 22nd base line from the east completely across the area and also extended the 23rd base line slightly, so as to intercept the railway. In the winter of 1954-55 a 27½-mile traverse of lakes and rivers furnished control along the extreme northern boundary of the forest section. When these lines had been surveyed, control for the north and south photographic flight lines was available at approximately 48-mile intervals.

Truck load of sawlogs—Flin Flon area.

Before the initiation of the forest inventory, vertical photography at a scale of 1:31,680 had been taken in the summer of 1947, covering the area north of the centre of Russell Lake. The balance of the area was photographed in 1952 at the same scale, under contract with a private photographic company.

Base mapping of areas was completed by the provincial Air Photo Library using the slotted template method. This work was done in a series of "laydowns," and in all cases the base maps were available to the field survey parties before they went out.

A seven-man field survey party, known as the "Cranberry" party, was in the field during the summer of 1953. A second party of the same size, known as the "Kississing" party, covered an area further north in 1954. These parties tallied approximately 1,000 one-fifth acre plots each year. The plots, together with plots taken by three field parties in the Nelson River Forest Section, making a total of 5,386 plots, were combined in order to make one set of tree volume, general stand volume, species distribution, size class distribution, and age-height tables for the two forest sections. The field survey also served as training for personnel who later interpreted unvisited forest types by stereoscopic inspection of photographs.

In the summer of 1955, a two-man type-checking party did further field work in the Lynn Lake Working Circle.

The various tree and stand volume tables, etc., referred to above were completed by June, 1955.

Table 10

Softwood and Hardwood Volume by Size Classes and Working Circles—Northern Mining Forest Section

WORKING CIRCLE	VOLUME IN CUNITS (100 cu. ft. Units)					
	Softwood		Hardwood		Total	
	4″ - 9″ D.B.H.	10″ + D.B.H.	4″ - 9″ D.B.H.	10″ + D.B.H.	4″ - 9″ D.B.H.	10″ + D.B.H.
Wekusko	357,092	37,511	84,881	10,207	441,973	47,718
Flin Flon	2,328,759	302,345	400,599	67,628	2,729,358	369,973
Sherridon	3,774,963	341,152	473,859	68,445	4,248,822	409,597
Pukatawagan	2,918,108	260,440	254,426	33,361	3,172,534	293,801
Lynn Lake	681,238	46,510	54,117	5,590	735,355	52,100
TOTAL	10,060,160	987,958	1,267,882	185,231	11,328,042	1,173,189
PER CENT	91.1	8.9	87.3	12.7	90.6	9.4

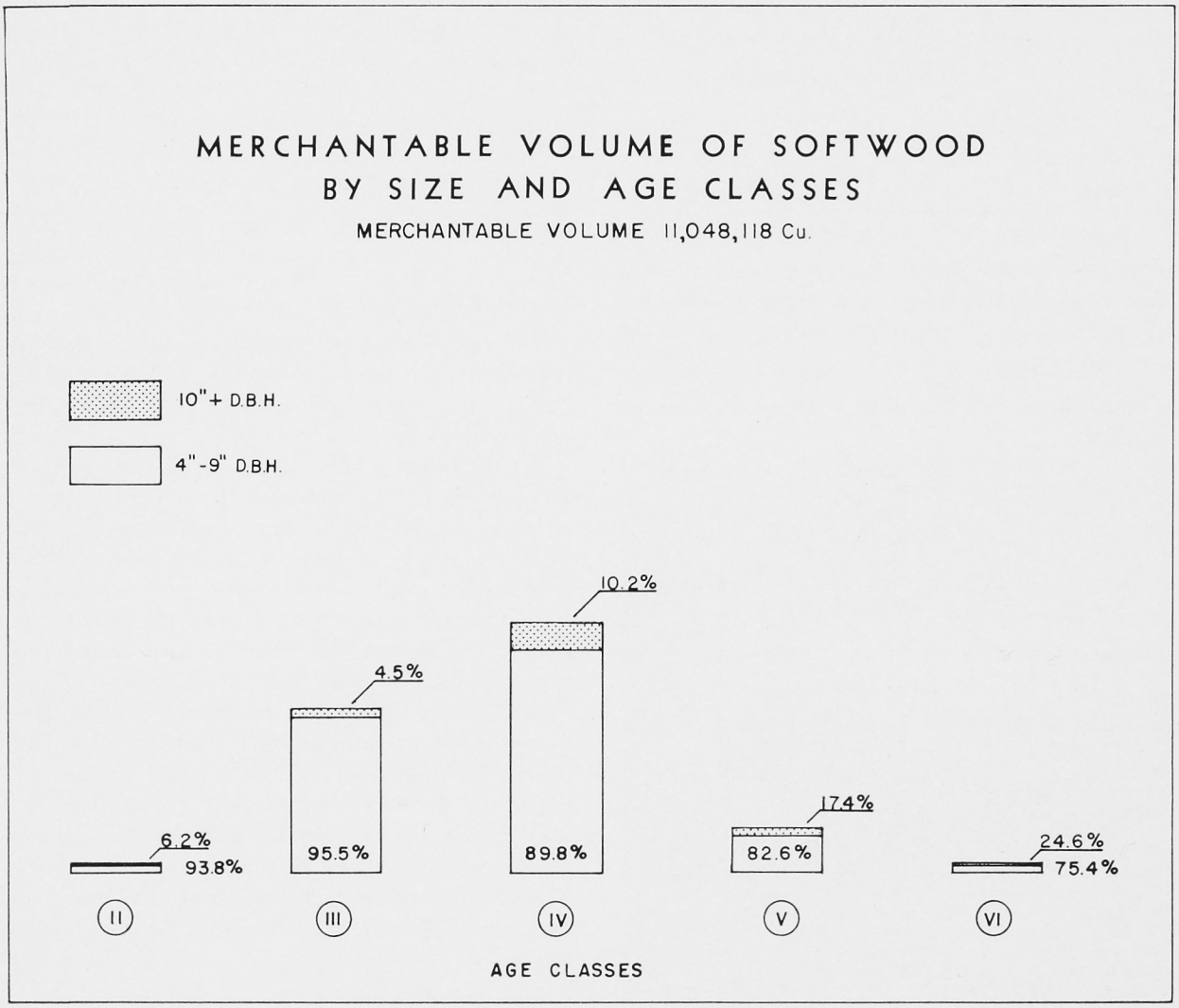


Figure 8.

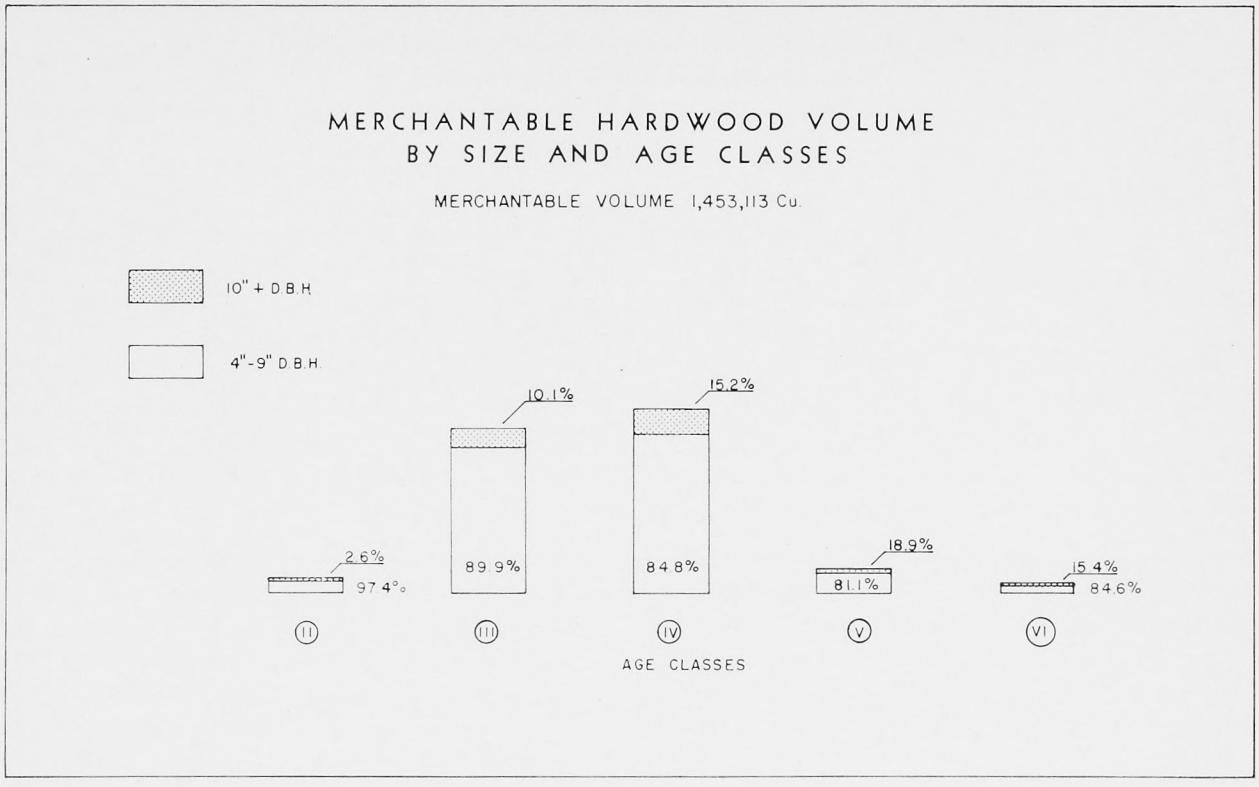


Figure 9.

Photo interpretation and forest mapping was finished by December, 1955. The compilation of the last working circle and the general summary for the whole forest section was delayed until about May, 1956.

Table 11

Softwood and Hardwood Volume by Working Circles–Northern Mining Forest Section

WORKING CIRCLE	*Volume in 100 Cubic Foot Units (Cunits)		
	CROWN LANDS		
	Softwood	Hardwood	Total
Wekusko	394,603	95,088	489,691
Flin Flon	2,631,104	468,227	3,099,331
Sherridon	4,116,115	542,304	4,658,419
Pukatawagan	3,178,548	287,787	3,466,335
Lynn Lake	727,748	59,707	787,455
TOTAL	11,048,118	1,453,113	12,501,231
PER CENT	88.4	11.6	100.0

*Net roundwood volume: stump height 1', top diameter 3".

Forest Utilization and Potential Yield

The main forest product of the area up to this date has been lumber, followed by pulpwood and railway ties. Other products of some importance are round timber and fuelwood.

White spruce is the choice saw-timber, partly on account of its size, although the odd black spruce is large enough for lumber production. Jack pine lumber is not in as great demand in this district as it is further south. Much of the production comes from tops and slabs of trees sawn for railway ties. A local industry at Flin Flon has used considerable quantities of jack pine in the manufacture of grain doors. Poplar lumber is produced only in small quantities on account of the availability of superior timber in other species. Most of the lumber produced in the Northern Mining Forest Section is used locally in connection with mining development and for housing in the mining communities. The leading mining operations of the area have been outlined under the heading "Development of the Area."

Spruce is the most valuable pulpwood tree, and of the two species–black and white, black spruce,

on account of its abundance and the high specific gravity of its wood, is used most. White spruce is also in demand, but on account of its larger size and relative scarcity is best reserved for use as lumber. Jack pine pulpwood, while available in large quantities, is not usually saleable on account of the long rail haul to the nearest pulp mills. For the same reason, peeled spruce pulpwood which is partially dried and consequently lighter in weight is in greater demand than rough or unbarked wood. The importance of rail haul costs in pulpwood marketing is brought out when it is considered that over 90 per cent of the wood produced in the Northern Forest District during the last five years has gone to United States' mills in Minnesota and Wisconsin, at an average rail distance of very close to 1,000 miles. The greater part of this pulpwood has originated in the Flin Flon Working Circle of the Northern Mining Forest Section, although some wood has come from further north, the most northerly shipping point being Hemming Lake, south of Sherridon.

The production of jack pine railway ties fluctuates widely from year to year, depending on economic conditions and the mileage of new railway being constructed in the country as a whole. A considerable proportion of Manitoba's tie cut comes from this forest section but all ties are shipped southward for wood preservative treatment.

Until a few years ago, fuelwood was an important forest product, being used both for heating in local towns and for power production in the first stages of mining development. For example, thousands of cords per year were cut in the vicinity of Lynn Lake for use in steam production in the early stages of development of that mining centre. During recent years, however, the use of wood for heating has fallen off rapidly in favor of oil, and hydro-electric power has replaced wood in that field.

Statistics of the timber cut annually on provincial Crown lands are recorded by administrative forest districts which have different boundaries from the forest sections used in the inventory. The Northern administrative district, for example, includes the whole of the Northern Mining and Lowlands North forest sections, about two-thirds of the Nelson River forest section and most of the Inaccessible Forest sub-zone. However, it has been possible to work out the portion of the cut which came from the forest section under consideration in this report for the last five years. The main products are lumber, pulpwood, and railway ties, and the average annual production for the years 1954-55 to 1958-59 has been approximately as follows:—

Lumber	3,248,000	ft. b.m.
Pulpwood	4,159	cords
Railway ties	20,040	pieces

Minor amounts of fuelwood, round timber, and poles are also cut. Converting the cut of lumber, pulpwood, railway ties, and minor products into a common unit of cubic feet, it is found that the average annual depletion from cutting is approximately 10,628 cunits or 12,504 cords.

Table 12

Softwood and Hardwood Volume per Acre—Merchantable Area by Working Circles—Northern Mining Forest Section

WORKING CIRCLE	VOLUME PER ACRE IN CUBIC FEET		
	Softwood	Hardwood	Total
Wekusko	430	103	533
Flin Flon	500	89	589
Sherridon	666	88	754
Pukatawagan	693	63	756
Lynn Lake	532	44	576
AVERAGE	603	79	682

Fire ranger's cabin.

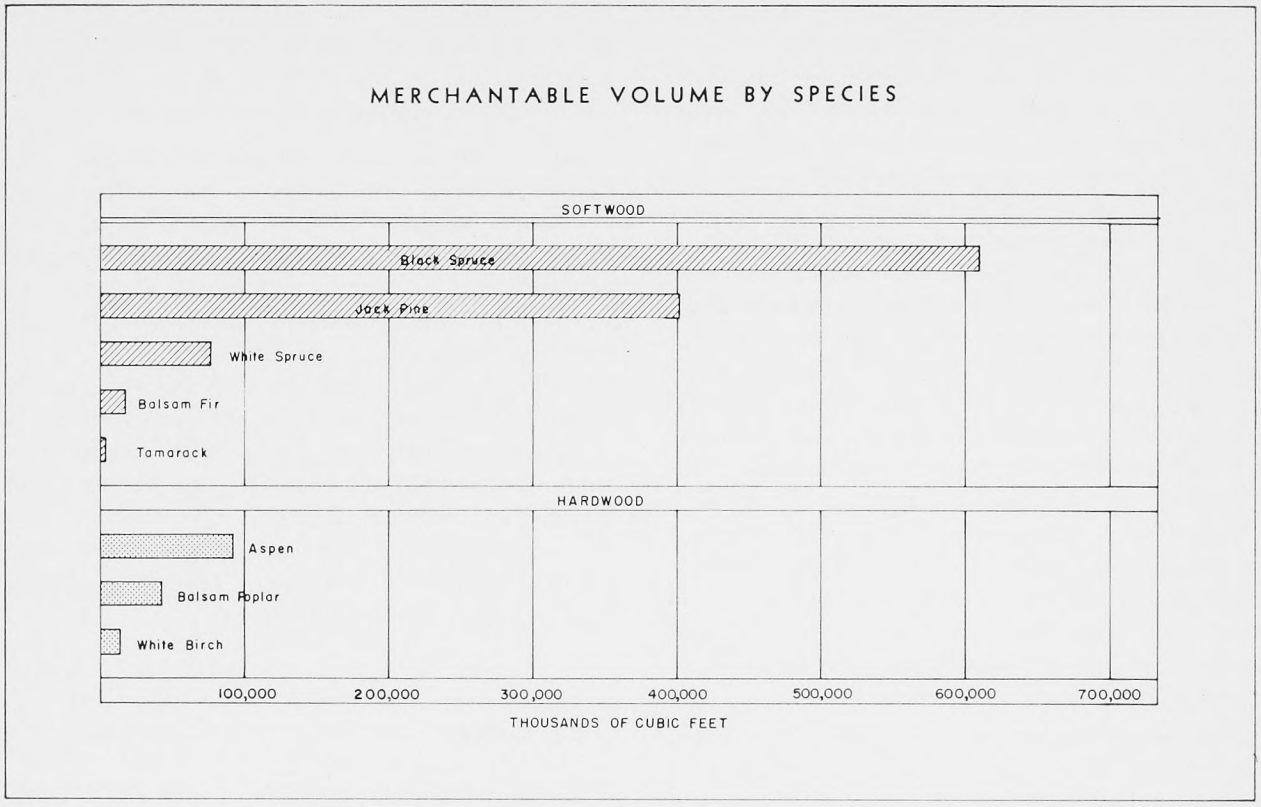


Figure 10.

The average annual depletion from fire during the years 1955 to 1959, inclusive, amounted to around 11,400 cunits or 12,800 cords, and the mean annual area burned over, including productive forest, nonproductive forest, and nonforested land, was about 9,000 acres. The fire reports show that more than two-thirds of the timber loss resulted from a single fire which started from railway right-of-way clearing in June, 1958.

Sunset on Reed Lake.

The allowable annual depletion of wood on a sustained yield basis has been calculated approximately, using the method described under "Allowable Cut" in the Appendix to this report. The result of the calculation is as follows:—

Allowable annual cut of softwood	220,962 cunits	or 260,000 cords
Allowable annual cut of hardwood	43,593 cunits	or 51,300 cords
Allowable annual cut all species	264,555 cunits	or 311,300 cords

This estimate based on the present stand is believed to be conservative, and it can be confidently predicted that with the improvement in fire protection of young growth areas and merchantable timber which is taking place, the sustainable annual

Table 13

General Stand Volume Table—Northern Mining Forest Section
(Data from Final Set of Curves)

HEIGHT CLASS	DENSITY CLASSES (In square feet of basal area per acre at breast height)								
	A 0′ - 20′	B 20′ - 40′	C 40′ - 60′	D 60′ - 80′	E 80′ - 100′	F 100′ - 120′	G 120′ - 140′	H 140′ - 160′	I 160′ - 180′
	VOLUME IN CUNITS PER ACRE (100 cu. ft.)								
4 (30′ - 40′)	1.12	3.69	6.31	8.86	11.52	14.09	.....	.....	.....
5 (40′ - 50′)	1.52	4.92	8.28	11.68	15.07	18.48	21.89	25.26	.....
6 (50′ - 60′)	1.86	5.99	10.25	14.30	18.56	22.81	27.01	31.24	35.49
7 (60′ - 70′)	.....	.....	12.18	17.13	22.23	27.16	32.18	37.23	42.23
8 (70′ - 80′)	.....	.....	.....	.....	.....	31.54	37.26	43.16	48.90
9 (80′ - 90′)	.....	.....	.....	.....	.....	.....	42.18	49.20	55.72

Volumes refer to Gross Round Wood Volume to 3″ top and 12″ stump.
Table based on 5,386 one-fifth acre plots measured in the Northern Mining and Nelson River Forest Sections.

yield of the future will be considerably greater. The field survey indicated that, in general, natural regeneration to coniferous species is satisfactory on burned-over and cut-over areas.

A comparison of the present yield and the potential yield, given above, indicates that there is a good prospect of a large expansion of forest industries in this section. Another favorable development has to do with the recent expansion of transportation routes into the Snow Lake area. When the forest inventory was initiated in 1951, the Accessible Forest Zone was given the boundaries as shown in Maps Nos. 1 and 2, and, therefore, the timber volume figures given above, and in the various tables showing forest areas and wood volumes in this report, have been based on the area within the boundaries as laid down at that time. It will be noted that Snow Lake lies practically on this boundary, and, therefore, the extension of the railway to that point opens up a new area to the north and east for which no area or volume figures are given in this present report. Further particulars of this area will be included in a later report on the Inaccessible Forest.

Shoreline, Krug Lake.

Appendix

SURVEY METHODS

Ground Control

Ground control for aerial photographs was obtained mainly from base lines, township outlines, and subdivision surveys established either before or during the progress of the forest inventory. The distance between control lines varied from one mile in the southern part to as much as 72 miles in the north. In certain cases it was necessary to make traverses of winter roads, lakes, and rivers in order to fill in blanks where cadastral surveys were lacking.

Air Photography

The photographs on which the inventory was based were summer verticals varying in scale from 1:15,840 to 1:36,000, taken mainly in the period 1946 to 1953, inclusive.

Base Mapping

The slotted template lay-down method of base mapping was used. A base map consisted simply of a large sheet of paper showing township grids on which were located the primary and secondary control points of the photographs covering the area.

Field Surveys

The type classification used in this survey was an adaptation of the system developed by S. T. B. Losee of the Abitibi Power and Paper Company. Types were differentiated by species, composition, height, density, site, and subtype, the following breakdown being employed:

(a) *Cover-type*

S : 75-100% conifers by basal area
M : 50- 75% conifers by basal area
N : 25- 50% conifers by basal area
H : 0- 25% conifers by basal area

(b) *Height Class*

1 : Average height of main stand 0-10 feet
2 : Average height of main stand 10-20 feet
3 : Average height of main stand 20-30 feet
Etc.

(c) *Density Class*

A : 0-20 square feet per acre basal area
B : 20-40 square feet per acre basal area
C : 40-60 square feet per acre basal area
Etc.

(d) *Site*

V_1 : Jack pine ridge top
V_2 : Black spruce ridge top
W : Hardwood upper slope
X_1 : Black spruce lower slope
X_2 : Mixed lower slope
Y_1 : Jack pine flat
Y_2 : Poplar flat
Z_1 : Wet flat (black spruce)
Z_2 : Cedar flat

(e) *Sub-type*

–1 : 0- 12% of conifer basal area jack pine
–2 : 13- 37% of conifer basal area jack pine
–3 : 38- 62% of conifer basal area jack pine
–4 : 63- 87% of conifer basal area jack pine
–5 : 88-100% of conifer basal area jack pine

The above subtypes were used in conjunction with all four cover-type symbols—S, M, N, and H, depending on the percentage of jack pine in the coniferous portion of the stand. Additionally, in the S cover-type there might be tamarack subtypes. These were shown by the suffixes L1, L2, L3, L4, and L5, denoting the same percentage of tamarack volume as the first suffixes did for jack pine.

The term type-aggregate has been used as referring to all types in a Forest Section which have common characteristics as to cover-type, height, density, site, and subtype. For example, the symbol "S7EX_1-1" denotes a type with 75-100 per cent of the basal area in coniferous species, average height 60-70 feet, basal area per acre 80 to 100 square feet, growing on a lower slope site and mainly black spruce, with a jack pine composition less than 12 per cent of the coniferous basal area.

Sampling was distributed as widely as possible over the total inventory area, the twin objectives being to obtain sufficient data for local tree and type-aggregate volume tables, and to familiarize the photo-interpreters with the varying stand conditions to be found in different localities.

Sampling was by means of one-fifth-acre plots (one-quarter chain wide by eight chains long) established at fixed intervals along cruise lines selected by the party chief. In order to obtain a well-distributed sample of all type-aggregates, the party chiefs were instructed to sample as many type

aggregates as possible from each camp site, and not to take too many plots in one particular type in the same general area. Information recorded on each plot included the cover-type, site class, tally by species of all trees over 3.5 inches D.B.H., and four height-age measurements of representative trees. Notes were also made on the topography, soil and young growth, minor vegetation, and the general condition of the stand. Sufficient form class measurements were made to determine for each species the relationship between form class, diameter, height, and site. Special notes were made on young growth areas.

Forest Maps

The location of all boundary lines between the various forest types was determined almost entirely from examination of the photographs with the aid of a stereoscope.

After photo interpretation, both forestry and planimetric information was transferred from the photos to the base maps by means of either a Sketchmaster or Seelyscope. The areas of the various forest strata were determined either by dot count or by measurement with a planimeter.

Each finished forestry map covers one township at the 1:15,840 scale, or four townships at smaller scales. Ozalid prints of the completed maps were prepared for distribution to district personnel and one master copy of each map was hand-colored for filing, using the standard colors recommended by the Federal Forestry Branch.

Interpretation and Compilation

After field sampling in a given area was completed, the final photo interpretation was made. Since it is on the quality of this work that the accuracy of the inventory largely depends, an effort was made to have the man most familiar with a particular area make the final photo interpretation for that area. Much of the final interpretation was done in the field by the party chiefs and cruisers at a time when stand conditions as they appeared on both the ground and the photos could readily be compared.

The first step in compilation was the transfer of field data to two sets of summary sheets. The height-age and form class data obtained from measurements of sample trees was used to prepare local tree volume tables, while the data on the tally sheets was the basis for the type-aggregate volume tables.

For each Forest Section, separate tree volume tables were prepared for each species, site, and height class. The Dominion Form Class Volume Tables were used in conjunction with the height-age and form class data to prepare the local volume tables. The standard system of harmonizing curves was used.

The next step was the preparation of a general stand volume table showing gross volume per acre, all species combined. Field plot data was segregated by height and density classes regardless of site and cover-type. Using the method of least squares and linear regression a series of straight lines was drawn and later harmonized by the Dwight method. Values read from these lines formed a general stand volume table showing average volume in cunits per acre by height and density classes for the whole Forest Section. See Table No. 13.

The next step was the determination of the proportion of each species in each type-aggregate. This was done by a special method of percentages and curves. Similar methods were used to determine the proportion of the two size classes, four to nine inches D.B.H., and ten inches plus. The percentages as arrived at by harmonizing the curves for each height class were applied to the previously calculated general stand volume table, and the results were tabulated as the final type-aggregate volume table.

Up to this point in compilation, stand age was not considered. However, the large number of height-age measurements obtained in the field made it possible to establish by means of a series of curves, the relationship between site, height, and age for each of the major species on each site. Age classes could then be assigned to all type-aggregates. Thus, when the final volume summaries were made, they were subdivided by cover-type and age class only; height, site, and density being omitted.

Gross volumes of each individual type were first tabulated in cubic feet by numbered types and later compiled in township units by species, cover-type, age class, size class, and land tenure.

In order to express the net rather than the gross volume, a cull factor was established for each species in each Forest Section. This factor was based on a general knowledge of the various species, and notes made by the cruisers regarding defects observed on the sample plots. The cull factor was applied to the gross figures for the Work-

ing Circle and not to the smaller units of type and township. See Table 14.

Table 14

Cull Factor by Species–Northern Mining Forest Section

Species	Cull *per cent*
White spruce	5
Black spruce	5
Balsam fir	25
Jack pine	15
Tamarack	10
Aspen	40
Balsam poplar	40
White birch	40

Reports

Fifty-five inventory summaries were compiled for Working Circles or Ranger Districts, each of these units averaging about 1,000 square miles in area. Each summary contains a breakdown of the area and net volume by cover-types and age classes. Subtotals are included for the Crown and patented portions of each unit. Net volumes are expressed in both cunits (100 cu. ft. units) and M ft.b.m. for the ten inch plus diameter group, and in cunits alone for the four to nine inch D.B.H. group. These inventory summaries were totalled by Forest Sections, and a report is being published on the forest resources of each Forest Section.

ROTATION

The length of the rotation for the various species depends on the site, the product to be cut, and, to a lesser extent, the climatic region. Table 15 gives tentative figures for the productive forest area of Manitoba. A range of rotation age is given depending mainly on whether the stand is to be cut for pulpwood or saw-timber.

Table 15

Rotation by Species

Species	*years*
White spruce	80 - 120
Black spruce	80 - 140
Balsam fir	60 - 80
Jack pine	60 - 90
Tamarack	70 - 100
Cedar	100 - 200
Aspen poplar	50 - 70
Balsam poplar	50 - 70
White birch	60 - 80

ALLOWABLE CUT

A determination of the allowable annual depletion by cutting, fire, etc., is necessary in order that the forest may be kept on a sustained yield basis. The compiled inventory data presents volume by cover-type, age class, and species while area is presented by age class and cover-type only. The method of calculation most suitable to the available data is by a volumetric formula.

The simplest formula for finding the annual yield, commonly known as the Von Mantel formula, is as follows:

$$\text{Annual Yield} = \frac{\text{Growing Stock}}{\text{Half the number of years in rotation}}$$

For general inventory purposes this formula has been used as the basis for calculation of the allowable cut by Working Circles, each species being calculated separately according to its average rotation age. A deduction of 20 per cent has been made to allow for contingencies such as loss from fire, windfall, insects, and disease.

In those areas which have established Working Plans such as the Southeastern Forest Section, the Duck Mountain Forest Reserve, Pulpwood Berth No. 1, and certain portions of the Lowlands South Forest Section, various alternative methods have been used in arriving at the Allowable Cut. It is usual in these cases to secure a more accurate estimate of the Allowable Cut by methods which take into account any unevenness in age class distribution.

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Common and Botanical Names of Tree Species Included in Timber Estimates

CONIFERS

White Spruce — *Picea glauca (Moench) Voss*
Black Spruce — *Picea mariana (Mill) BSP.*
Balsam fir — *Abies balsamea (L.) Mill*
Jack pine — *Pinus banksiana Lamb.*
Tamarack — *Larix laricina (Du Roi) K. Koch*

HARDWOODS

Aspen poplar — *Populus tremuloides Michx*
Balsam poplar — *Populus balsamifera L.*
White birch — *Betula papyrifera Marsh.*

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